

Appendix B

Wall Loadings - Check Lists

B-1. Introduction

After the amount or intensity of the individual loads acting on lock walls or monoliths have been determined as separate considerations, the possible combinations of such loads that will determine the most adverse condition must be established. Conditions and combinations of loadings that will ordinarily require examination are described below. These loads should be combined appropriately to determine the critical conditions for stability and wall stresses. However, independent checks of each structure under consideration should be made to determine whether these conditions are adequate for determination of the most critical loading.

B-2. General Design Loading Conditions

a. Usual. This case is the normal operating condition and should account for the most severe loads during a complete lockage cycle and for the most severe stability requirements experienced during normal conditions.

b. Unusual. Under these conditions, the design should account for unusual loads that can occur at normal lock sites, such as vessel impact, unusual saturation levels, scheduled pool drawdowns, low-water levels, planes, ice thrusts, wind loads, and operating basis earthquakes. The unwatered condition of the lock is also considered in this case with loads corresponding with expected water levels and uplift conditions. Construction conditions are also considered an unusual load case. Under these conditions, full earth load, moist or saturated, with or without uplift, according to construction plans, possible use as part of a cofferdam, and all construction surcharge loads should be considered.

c. Extreme. The occurrence of very unlikely events, such as a probable maximum flood (PMF) or maximum credible earthquake (MCE), should be considered extreme.

B-3. Design Loading for Stability - Lock Chamber Land Walls

a. Case 1 - normal operating condition (usual). The requirements are as follows:

- (1) Backfill to a predetermined height.
- (2) Saturation line to an assumed level.

- (3) Surcharge due to sloped fill.
- (4) Loading surcharge if any.
- (5) Hawser load.
- (6) Lower pool in lock chamber.
- (7) Uplift as defined by water elevations.

b. Case 2 A - with drawdown operating conditions (unusual). The same requirements as for Case 1 are included except for the following conditions:

- (1) Lower pool drawn down.
- (2) Extreme low-water stage.

c. Case 2 B - with drawdown ineffective operating condition (unusual). The same requirements as for Case 1 are included except for the condition of the raised saturation level caused by ineffective drain or ponding.

d. Case 2 C - maintenance condition (unusual). The same requirements as for Case 1 are included except for the following conditions:

- (1) Lock chamber unwatered to a predetermined level.
- (2) No hawser load.

e. Case 2 D - emergency conditions (unusual). The same requirements as for Case 1 except for the condition of an earthquake load added in the most critical direction.

f. Case 3 A - construction conditions (unusual). The requirements include:

- (1) Moist backfill to a predetermined height.
- (2) Permanent or construction surcharge.
- (3) Wind as applicable.
- (4) No uplift.

g. Case 3 B - construction condition with cofferdam (unusual). The same requirements as for Case 3 A are included except for the condition that hydrostatic forces are active instead of moist earth in accordance with construction and cofferdam plans.

B-4. Design Loading - Lock Chamber River Wall

a. Case 1 A - normal operating (usual) condition.
The requirements are as follows:

- (1) Upper pool in lock chamber.
- (2) Lower pool outside, if dam is upstream of section.
- (3) Uplift as defined by water elevations.
- (4) Vessel impact.

b. Case 1 B - normal operating (usual) condition.
The requirements are as follows:

- (1) Lower pool in lock chamber.
- (2) Upper pool outside, if dam is downstream of section.
- (3) Uplift as defined by water elevations.
- (4) Hawser loads.

c. Case 2 A - operating condition with drawdown (unusual). The same requirements as for Cases 1 A and 1 B are included except for the following conditions:

- (1) Applicable pool drawn down.
- (2) Extreme low-water stage for lower pool only.

d. Case 2 B - maintenance condition (unusual). The same requirements as for Cases 1 A and 1 B are included except for the condition of a lock chamber unwatered to a predetermined level.

e. Case 2 C - emergency condition. The same requirements as for Cases 1 A and 1 B are included except for the condition of an earthquake load added in the most critical direction.

f. Case 3 - construction condition (unusual). The requirement is that hydrostatic forces are active in accordance with construction or cofferdam plans.

B-5. Design Loading - Lock Chamber Intermediate Wall

a. Case 1 A - normal operating condition (usual).
The requirements are as follows:

- (1) Upper pool in main lock.
- (2) Lower pool in auxiliary lock or outside of lock downstream of auxiliary lock.
- (3) Uplift as defined by water elevations.
- (4) Hawser load in auxiliary lock.
- (5) Vessel impact in main lock.

b. Case 1 B - normal operating condition (usual).
The requirements are as follows:

- (1) Upper pool in auxiliary lock.
- (2) Lower pool in main lock.
- (3) Uplift as defined by water elevations.
- (4) Hawser load in main lock.
- (5) Vessel impact in auxiliary lock.

c. Case 2 A - operating condition with drawdown (unusual). The same requirements as for Cases 1 A and 1 B are included except for the following conditions:

- (1) Applicable pool drawdown.
- (2) Extreme low-water stage for lower pool only.

d. Case 2 B - maintenance condition (unusual). The same requirements as for Cases 1 A and 1 B except for the following conditions:

(1) Applicable lock chambers unwatered to a predetermined level.

- (2) No impact.

e. Case 2 C - emergency condition (unusual). The same requirements as for Cases 1 A and 1 B except for the following conditions:

- (1) Earthquake load added in most critical direction.
- (2) No impact.

f. Case 3 - construction condition (unusual). The requirement is that hydrostatic forces are active in accordance with construction or cofferdam plans.

B-6. Design Loading - Upper and Lower Gate Bays

a. Case 1 A - normal operating condition (usual) - gate loaded. The requirements are as follows:

- (1) Gates mitered.
- (2) Upper pool upstream of gates.
- (3) Lower pool downstream of gates.
- (4) Applicable wall loadings as defined in paragraphs C-3, C-4, and C-5.

b. Case 1 B - normal operating condition (usual) - gates unloaded. The requirements are as follows:

- (1) Gates swinging free in approximate mitered position.
- (2) For upper gate bay, upper pool in gate bay.
- (3) For lower gate bay, lower pool in lock chamber.
- (4) Applicable wall loadings as defined in paragraphs C-3, C-4, and C-5.

c. Case 2 B - operating conditions with drawdown (unusual). The same requirements as for Cases 1 A and 1 B are included except for the following conditions:

- (1) Pools in lock chamber or lock entrance drawn down or with extreme low-water stages.
- (2) Uplift as defined by water elevations.

d. Cases 2 C and 2 D - operating drains ineffective condition (unusual). The same requirements as for Cases 1 A and 1 B are included except for the condition of the raised saturation level caused by ineffective drains or ponding.

e. Case 2 E - maintenance condition (unusual). The same requirements as for Case 1 B are included except for the following conditions:

- (1) Lock chamber unwatered to a predetermined level.
- (2) Uplift as defined by water elevations.

f. Cases 2 F and 2 A - emergency condition (unusual). The same requirements as for Cases 1 A and 1 B are included except for the condition of earthquake loads added in most critical direction.

g. Case 3 A - construction condition (unusual). The requirements are as follows:

- (1) Moist backfill to a predetermined height.
- (2) Permanent or construction surcharge.
- (3) Wind as applicable.
- (4) No uplift.
- (5) Gates swinging free in appropriate mitered position.

h. Case 3 B - construction with cofferdam condition (unusual). The same requirements as for Case 3 A are included except for the condition that hydrostatic forces are active instead of moist earth in accordance with construction and cofferdam plans.

B-7. Design Loading - Upper and Lower Approach Walls

a. Case 1 - normal operating condition (usual). The requirements are as follows:

- (1) Upper or lower pool on face of wall as applicable.
- (2) Saturated fill.
- (3) Upper or lower pool on back face of wall as applicable.
- (4) Boat impact on face of wall at most critical angle of incidence and force.
- (5) Hawser pull away from face of wall as applicable.
- (6) Uplift as defined by water elevations.

b. Case 2 - operating condition with earthquake (extreme). The same requirements as Case 1 are included except for the following conditions:

- (1) Earthquake in most critical direction.
- (2) No impact or hawser pull.

c. Case 3 - construction condition (unusual). The requirements are as follows:

- (1) Moist backfill.
- (2) Permanent or construction surcharge.
- (3) Wind as applicable.
- (4) No uplift.

B-8. Design Loading - Upper and Lower Sills

a. Case 1 - normal operating condition (usual). The requirements are as follows:

- (1) Upper pool upstream of gate.
- (2) Lower pool downstream of gate.
- (3) Fill or silt to top of sill on upstream side.

(4) Applicable gate loads for vertically framed miter gates and rolling gates.

(5) Uplift and vertical water loading as defined by water elevations.

b. Case 2 A - operating condition with drawdown (unusual). The same requirements as for Case 1 are included except for the following conditions:

- (1) Lower pool drawdown.
- (2) Extreme low-water stage.

c. Case 2 B - maintenance condition (unusual). The requirements are as follows:

- (1) Upper pool upstream of temporary closure structure.
- (2) Lock chamber unwatered.
- (3) Uplift and vertical water loading as defined by water elevations.